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Static Compression of Phase Egg up to 40 GPa

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Phase Egg, AlSiO3OH, is an important candidate for water reservoir in the cold slabs descending into the transition zone. It was first described by Eggleton et al. (1978) then synthesized by Schmidt et al. (1998), who report a monoclinic structure with spacegroup P21/n. It has a volume of V0 = 212.99(1) A3 and the zero pressure density is 3.74 g/cm3.

We have studied the stability of this phase by in situ x-ray diffraction experiments at high pressure and high temperature. The Kawai anvil (MA8-multianvil) driven by the cubic guideblock and 3000 ton uniaxial press system was used to synthesize sample at Tohoku University. The diffraction experiments were carried out using the multianvil press system, SPEED 1500 at Spring8 and MAX-III at Photon Factory. Phase Egg was found to be stable at least up to 1273 K and 22 GPa. Two decomposition reactions were observed: phase Egg decomposes into d-AlOOH and stishovite at 1273 K and above 22 GPa and it transforms into corundum + stishovite + fluid at 25 GPa and above 1473 K.

We have now performed an in situ x-ray diffraction experiment on phase Egg in order to dertemine the equation of state of this phase at room temperature up to 40 GPa. Sample was loaded into a diamond-anvil cell using helium as a pressure-transmitting medium. We have found a bulk modulus K = 161 +/- 4 GPa with K' = 6.1, which corresponds to the values found in other hydrous phases, such as hydrous wadsleyite, hydrous ringwoodite and superhydrous phase B, expected to exist in the transition zone. The most recent results on the equation of state for phase Egg will be presented.